Deceased Organ Donor Management: Does Hospital Volume Matter?

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BACKGROUND: Identification of strategies to improve organ donor use remains imperative. Despite the association between hospital volume and outcomes for many common disease processes, there have been no studies that assess the impact of organ donor hospital volume on organ yield.

STUDY DESIGN: A prospective observational study of all deceased organ donors managed by 10 organ procurement organizations across United Network for Organ Sharing regions 4, 5, and 6 was conducted from February 2012 to June 2015. To study the impact of hospital volume on organ yield, each donor was placed into a hospital-volume quartile based on the number of donors managed by their hospital. Stepwise logistic regression was used to identify the independent effect of hospital volume on the primary outcomes measure of having $\geq$4 organs transplanted per donor.

RESULTS: Data from 4,427 donors across 384 hospitals were collected and hospitals were assigned quartiles based on their volume of deceased donors. Hospitals managed a mean $\pm$ SD of 3.3 $\pm$ 5.2 donors per hospital per year. After adjusting for age, ethnicity, donor type, blood type, BMI, creatinine, and organ procurement organization/donor service area, being managed in hospitals within the highest volume quartile remained a positive independent predictor of $\geq$4 organs transplanted per donor (odds ratio = 1.52; 95% CI 1.29 to 1.79; $p < 0.001$).

CONCLUSIONS: Deceased organ donor hospital volume impacts organ yield, with the highest-volume centers being 52% more likely to achieve $\geq$4 organs transplanted per donor. Efforts should be made to share practices from these higher-volume centers and consideration should be given to centralization of donor care. (J Am Coll Surg 2017;224:294−300. Published by Elsevier Inc. on behalf of the American College of Surgeons.)

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During the past 2 decades, hospital volume has been the focus of numerous studies, with systematic reviews of the available literature suggesting high volume to be associated with improved outcomes.[1,2] Notwithstanding advancements in surgical care and an increased focus on quality improvement during the ensuing years, recent repeat analysis in the modern era indicates that there is a strong inverse relationship between hospital volume and mortality for patients undergoing surgery, suggesting a continued opportunity for improving systems of care.[3,4] This research, which evaluates the impact of hospital-level factors on patient outcomes, has largely been enabled by the development of standardized approaches for gathering and analyzing data across institutions. Despite the considerable amount of investigation that continues to be done on delineating the volume-to-outcomes relationship in both medical and surgical patients, however, there has yet to be a study to assess the impact of organ donor hospital volume on organ yield.

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Abbreviations and Acronyms

DCDD = donors after circulatory determination of death
DNDD = donors after neurologic determination of death
DSA = donor service area
ECD = expanded criteria donors
OPO = organ procurement organization
OR = odds ratio
OTPD = organs transplanted per donor
SCD = standard criteria donor

Most recently, strategies to improve deceased donor organ use have focused largely on standardization and optimization of practices that guide the management of the individual donor.[5-9] Although implementation of these approaches has been shown to increase the number of organs transplanted per donor (OTPD), as well as the quality of grafts available for transplantation, the impact of hospital-level factors on outcomes remains unknown.[6-8,10,11] Therefore, our objective was to determine the impact of donor hospital volume on OTPD.

METHODS

Study design

A prospective, observational study of all donors after neurologic determination of death (DNDD) and donors after circulatory determination of death (DCDD) from 10 organ procurement organizations (OPOs) in United Network for Organ Sharing Regions 4, 5, and 6 (covering Oregon, California, Nevada, Utah, New Mexico, Arizona, and Texas), was performed from February 2012 to June 2015. Among DNDDs, standard criteria donors (SCDs), as well as expanded criteria donors (ECDs), were included. Expanded criteria donors were donors who were either 60 years or older or donors who were 50 to 59 years old and had at least 2 of the following: hypertension, terminal serum creatinine >1.5 mg/dL, or death caused by CVA. Although ECD was originally developed as a set of donor criteria that helped identify increased risk of graft failure in renal allograft recipients, it has more generally been used for the classification of marginal deceased organ donors.[12] Each OPO had its own process in place for obtaining authorization for donation and, in the majority of cases, the OPOs included in this study reported that they were responsible for approaching the family. In situations where members from the donor hospital were involved in the process, they were accompanied by trained specialist staff. The OPOs and their corresponding geographic donor service areas (DSAs) were de-identified and arbitrarily numbered for the purpose of analysis. Of note, OPO/DSA number 9 entered the study in November 2013 and OPO/DSA number 8 in January 2014. With regard to IRB approval, this study was reviewed at the Veterans Affairs Portland Health Care System IRB and was determined to represent nonhuman subject research.

Data collection and outcome measures

Donor demographics, blood type, cause of death, OPO/DSA, and creatinine before procurement were collected prospectively through use of the United Network for Organ Sharing Donor Management Goals Registry Web Portal (https://nationaldmg.org). These data were entered remotely by the OPOs managing each donor. To study the impact of hospital volume on organ yield, each donor was placed into a hospital-volume quartile based on the number of donors managed by their hospital during the study period. Both DNDDs and DCDDs were included in total donor counts for the designation of hospital-volume quartile, as it was believed that excluding DCDDs would not accurately reflect the experience of a donor hospital, as even the management of DCDDs (although different than that of DNDDs) still requires the establishment of institutional policies and coordination with OPOs. Hospital quartile 1 was the lowest volume, and hospital quartile 4 was the highest volume. For any OPOs that joined the study after February 2012, volumes were normalized to account for late entry. The primary outcome measure was identification of predictors of ≥4 OTPD. This numeric cutoff represents a slightly higher mean OTPD goal than the national goal of 3.75 OTPD established by the Donation and Transplantation Community of Practice in 2013 (http://healthcarecommunities.org). It is also 1 more OTPD than the current national mean of 3 (based on OPTN data as of May 6, 2016). By establishing a cutoff higher than these thresholds, the analysis aimed to identify predictors of high performance. A categorical outcomes variable was chosen to provide an interpretable end point that, in the context of having already established national metrics, was believed to be clinically relevant.

Statistical analysis

A 2-part analysis was performed to identify predictors of ≥4 OTPD. For this analysis, only DNDDs (both SCD and ECD) were included, as DCDDs would inherently be disadvantaged in meeting the primary outcome measure of ≥4 OTPD. First, a univariate analysis was conducted to assess age, BMI, blood type, ethnicity, donor type, cause of death, OPO/DSA, donor hospital volume, and final creatinine before organ recovery for donors achieving ≥4 OTPD. Continuous variables were analyzed using ANOVA and categorical variables were compared using chi-square tests. Univariate logistic regression was

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